International Cooperation in AGRICULTURAL RESEARCH

A Guidebook for
Canadian Researchers

A copublication of the
Association of Universities and Colleges of Canada
and the
International Development Research Centre

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International Development Research Centre
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IDRC
CANADA

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support technical and policy research designed to adapt science and technology to the needs of developing countries. The Centre's five program sectors are Environment and Natural Resources, Social Sciences, Health Sciences, Information Sciences and Systems, and Corporate Affairs and Initiatives. The Centre's funds are provided by the Parliament of Canada; IDRC's policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

Association of Universities and Colleges of Canada

Association des Universités et Collèges du Canada

The Association of Universities and Colleges of Canada is the voice of Canada's 89 university and university-level colleges on the national and international scene. The AUCC's International Division acts as an information clearinghouse on international cooperation in higher education. It offers liaison services; publishes newsletters, updates, and reports; administers programs in international higher education; and represents the Canadian university community at international meetings.

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Foreword

The Association of Universities and Colleges of Canada (AUCC) and the International Development Research Centre (IDRC) are pleased to publish this guide to the international agricultural research centres. It is our hope that by making this information available to Canadian university researchers, many more will be able to participate in the work of this unique constellation of research centres dedicated to improving the world's food supplies.

This guidebook offers a glimpse of the mandates, research programs, and opportunities for collaboration open to Canadian professors on sabbatical, visiting scientists, postdoctoral placements, and graduate students. These programs and opportunities range across the disciplines of agricultural science, engineering, information sciences, and social sciences, involve almost every country in the developing world, and are aimed at strengthening national research systems.

Sound and timely research is very much required so that we may resolve global problems such as livestock diseases threatening world food production, the decreasing genetic diversity of plants, and unequal food distribution. The AUCC and IDRC hope that the Canadian academic community working in international agriculture will find this guide useful, and that it will enable them to contribute more to international cooperation in agricultural research and development.

Keith Bezanson
President
IDRC

Claude Lajeunesse
President
AUCC

Introduction

International cooperation in agricultural research is critical to world development. Critical to international cooperation is a global, informal system of agricultural research.

In this system, there are four main elements: leading institutes of agricultural science, institutes of applied research, institutes at which technologies are adapted to the specific conditions of farmers, and the farmers themselves. There is also an important subset of institutes dedicated to strategic and applied research in tropical and subtropical agriculture: the international agricultural research centres (IARCs). The IARCs, along with many regional centres, target their work principally to developing countries.

Worldwide there are now 22 internationally supported research centres working to increase sustainable food production as a means of improving the nutritional level and general economic well-being of low-income people of the developing world. At the heart of this network is the Consultative Group on International Agricultural Research (CGIAR). CGIAR is an informal association of countries, international organizations, and private institutions that provide funding and direction. It is cosponsored by the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and the World Bank, and supported by a total of 35 donors, including countries, foundations, United Nations agencies, and multilateral development banks. CGIAR operates without a formal charter, relying on consensus derived from a sense of common purpose, as declared in its mission statement:

> Through international research and related activities, and in partnership with national research systems, [the mission of CGIAR is] to contribute to sustainable improvements in the productivity of agriculture, forestry, and fisheries in developing countries in ways that enhance nutrition and well-being, especially among low-income people.

CGIAR is supported by a Technical Advisory Committee (TAC) and an executive secretariat provided by the World Bank. TAC is made up of a

chairperson and 18 scientists, drawn equally from developed and developing nations. It makes recommendations on research programs and priorities and monitors performance through program and budget reviews. It also supervises periodic external reviews of the centres as undertaken by panels of independent scientists. TAC is supported by a secretariat, provided by the three cosponsors of CGIAR and located at FAO headquarters in Rome.

Within the CGIAR system proper, there are 18 internationally funded research centres. Another four centres, funded by many of the same donors, conduct research toward similar ends, expanding somewhat on the focus of CGIAR. Each centre is independent and autonomous; they all have their own structure, mandate, and objectives, and are overseen by independent boards of trustees.

There are also many regional centres and groupings of countries that support agricultural and forestry research. Examples of regional centres include the Caribbean Agricultural Research and Development Institute (CARDI), the International Centre for Integrated Mountain Development (ICIMOD), and the Tropical Agriculture Research and Training Centre (CATIE). The country groupings include the Association of South East Asian Nations (ASEAN), the Arab Centre for the Study of Arid Zones and Dry Lands (ACSAD), the Permanent Interstate Committee on Drought Control in the Sahel (CILSS), and the Southern African Development Coordination Committee (SADCC).

A Brief History

Tropical agricultural research began with colonial efforts in India and Africa. It was not until the 1940s, however, that efforts in international collaboration began. At that time, the Rockefeller Foundation and the Mexican government initiated a joint crop-improvement program for wheat and maize. This cooperative effort of Mexican and American scientists developed high-yielding, semidwarf wheats, which allowed Mexico to become self-sufficient in grain production by the mid-1960s. Introduced to India and Pakistan, these varieties were exceptionally successful, producing record-breaking harvests. The Green Revolution had begun.

The phenomenal success of these improved varieties of wheat encouraged the formation of the first IARCs. In 1960, the Rockefeller and Ford foundations established the International Rice Research Institute (IRRI, see p. 34) in the Philippines. In 1966, the original research centre in Mexico became the International Centre for Maize and Wheat Improvement (CIMMYT, see p. 18). In 1967, the International Center for Tropical Agriculture (CIAT, see p. 15) in Colombia and the International Institute of Tropical Agriculture (IITA, see p. 23) in Nigeria were founded.

These four centres quickly demonstrated the potential of internationally supported agricultural research as an instrument of development and cooperation. Those who first recognized this potential — the scientists and policymakers associated with the original four centres — worked to increase funding and expand the network to cover a wider range of commodities and agroecological regions. Their efforts bore fruit. In 1971, under the joint sponsorship of FAO, UNDP, and the World Bank, the Consultative Group on International Agricultural Research was created. In that year, there were 20 donors and an annual budget of 20 million United States dollars (USD). Over the next 8 years, 1972 through 1980, 9 centres were added, bringing the total to 13. Other centres were also created outside the CGIAR system. In 1992, there are 35 donors and an estimated core budget of 251 million USD. With additional funds for associated special projects, the total budget reaches 314 million USD.

The Centres: A General Description

The mandates of the centres cover a wide range of issues. They address particular food crops, specific agroecological zones, livestock production and health, resource management, conservation of plant genetic resources, forestry and agroforestry, policy, and agricultural research management. As a network, the centres cover all the major food crops and production systems of the developing world.

The programs of commodity-oriented centres vary, but there are common components:

- The conservation of genetic resources;
- Biological research to increase yields through genetic improvement;

- Farming systems studies to better understand production constraints at the farm level and to improve on traditional practices; and
- Training and other activities to strengthen national research systems.

The IARCs have taken the lead in germ-plasm conservation. Since 1975, CGIAR-sponsored IARCs have built up the world's largest collection of plant genetic resources: some 465 thousand individual accessions, accounting for 35 percent of global unduplicated holdings. This material is available without restriction to researchers worldwide.

Early on, the network emphasized commodity improvement. Since then, the system has evolved to recognize and address the twin needs of productivity and sustainability. The last two years have seen particularly rapid change. CGIAR has broadened its mandate to include natural resource management and forestry and has expanded to include and to create new institutions to address this larger mandate. One important and recent decision of the network has been to develop strong ecoregional foci to complement the strong global programs.

With their variety of mandates, the centres come in many shapes and sizes. All boast modern, well-equipped facilities appropriate to their vocations. Some are in urban settings; others, in rural areas. Most have headquarters in association with an experimental farm, and many maintain research substations that represent the variety of agroclimatic conditions found in the developing world.

Canada's Role

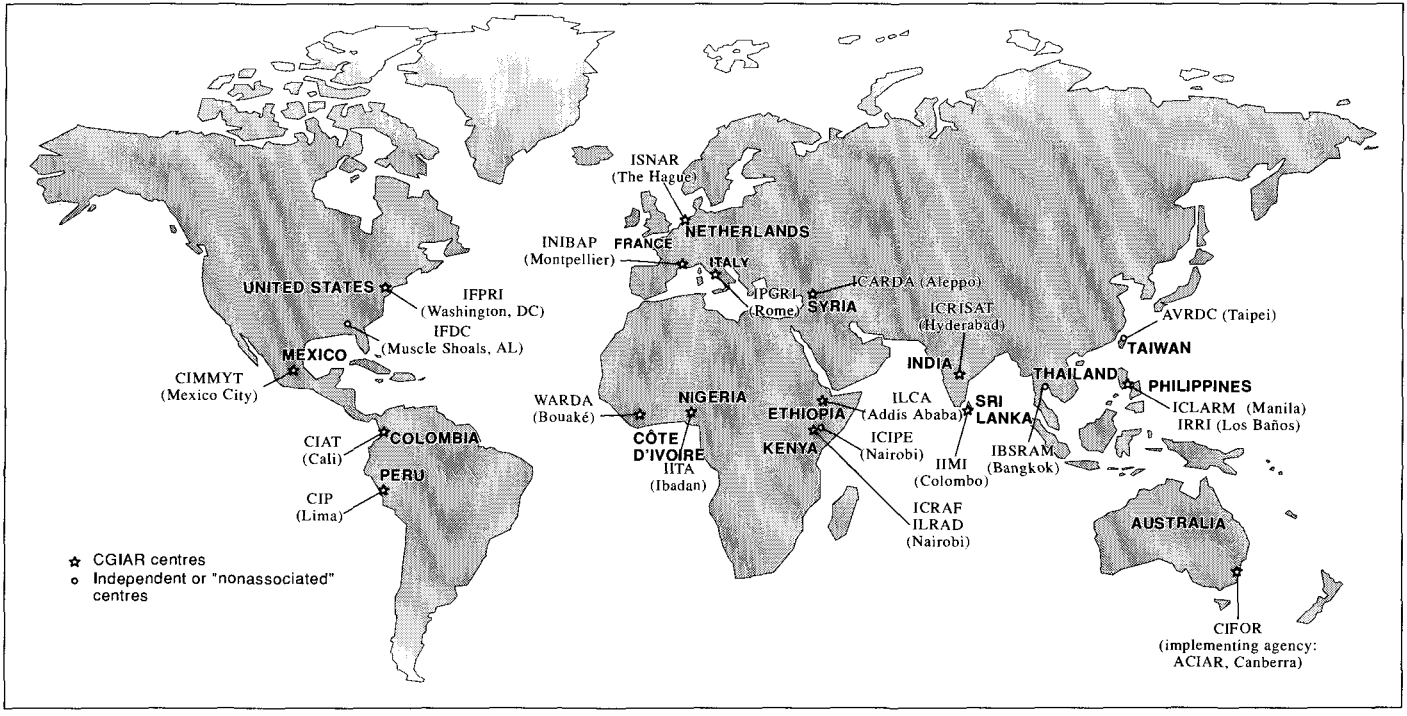
Canada has been a major contributor to CGIAR over the years, both financially and intellectually. Canada is the third largest country donor and the fourth largest donor overall (behind the United States, the World Bank, and Japan). In the fiscal year 1991/92, the Multilateral Branch of the Canadian International Development Agency (CIDA) contributed 18.7 million Canadian dollars (CAD) to the core budget and special projects of the CGIAR centres. Adding core funding for some independent or "nonassociated" centres and funding from bilateral programs, CIDA's 1991/92 contribution reached almost 30 million CAD. Since 1968, CIDA has contributed 217 million CAD to the core budgets of the IARCs.

Canada's International Development Research Centre (IDRC) is also a member of CGIAR. In 1992/93, IDRC will contribute more than 2.5 million CAD to CGIAR centres and another 0.5 million to the independent centres. This support is restricted mainly to projects with strong and direct links with national programs. IDRC has played an important role in the evolution of CGIAR policy, leading by example in developing approaches for farming systems research and in establishing the discipline of agroforestry. IDRC has also been closely involved in establishing many of the IARCs, including the International Food Policy Research Institute (IFPRI, see p. 21) in 1975, the International Center for Agricultural Research in the Dry Areas (ICARDA, see p. 11) in 1976, the International Council for Research in Agroforestry (ICRAF, see p. 14) in 1977, and the International Network for the Improvement of Banana and Plantain (INIBAP, see p. 29) in 1984. For ICARDA, ICRAF, and INIBAP, IDRC acted as implementing agency.

Canadians are represented on the international boards of 13 CGIAR centres, chairing 3 of these. At three of the IARCs, a Canadian serves as Director General; all three, as well as one Costa Rican national, are former members of IDRC's program staff. Canadians also serve on the scientific and administrative staffs of most of the centres. For many years, a Canadian chaired CGIAR and, currently, the TAC chairman is a Canadian. Very importantly, there has been a history of strong collaboration between Canadian institutions and the IARCs.

Linkages with the IARC system offer a great potential for mutual benefit. With excellent facilities, world-class germ plasm collections, and staff of the highest calibre, there is a myriad of possibilities for research collaboration as well as student, postdoctoral, and visiting scientist placements. Opportunities span a wide range of disciplines, from biology and agricultural science, through the social sciences (such as economics and anthropology), to engineering, information science, and research management. Recognizing the enormous potential for mutual benefit, the Association of Universities and Colleges of Canada (AUCC), the Canadian National Committee for the Commission on the Application of Science to Agriculture, Forestry and Aquaculture, the National Research Council of Canada, and IDRC encourage an increased level of participation by Canadian scientists in the IARC system.

The International Agricultural Research Centres



As one way of encouraging this participation, IDRC supports the Young Canadian Researchers Award. Canadian graduate students planning to undertake their field research in a developing country (including placement at an IARC) are eligible. Directed primarily to doctoral students, the Award is open to those whose proposed research is relevant to IDRC's interests and priorities. Award tenure corresponds to the period of field research in the developing country. Value of the Award is 20000 CAD per year. Doctoral students whose field research requires more than 12 months may be considered for longer periods of tenure, to a maximum of 24 months. As well, IDRC supports selective sabbatical placements at IARCs and placements within national agricultural research programs.

This Booklet

This booklet offers a glimpse of the IARCs, with information on their mandates, research programs, and opportunities for collaboration. In addition to research programs, most centres have training and information programs. As well, many centres welcome specialized skills in support areas, such as software development, information management, publishing, writing, and greenhouse management. Recruitment announcements for positions at IARCs regularly appear in AUCC's *ILO Update*, which is sent monthly to the International Liason Officer of each Canadian university.

Most centres are engaged in diverse research activities. Also, several centres act as coordinating bodies rather than research institutions. As such, they are linked with other institutions that may offer opportunities for Canadian collaboration.

The needs of the centres and their capacity to host visiting scientists change rapidly. Those interested in exploring the possibilities for linkages with the centres, including the possibilities for sabbatical placements, should communicate directly with the contact person identified for each centre.

THE CGIAR CENTRES

Center for International Forestry Research

Established:	1992
Budget:	2.5 million USD
Address:	Australian Centre for International Agricultural Research, GPO Box 1571, Canberra ACT 2601, Australia
Fax:	(06) 257-3051
Telephone:	(06) 248-8588
Telex:	AA62419
Contact:	Dr Ian Bevege

CGIAR is in the process of establishing an international mechanism to coordinate, stimulate, and, to some degree, undertake research to contribute to the sustainable management of the world's tropical forests. The Australian Centre for International Agricultural Research (ACIAR) is acting as the implementing agency for the Center for International Forestry Research (CIFOR). The first meeting of the Board of Trustees of CIFOR occurred in July 1992.

The diversity of forestry problems and the variety of social, cultural, economic and political situations in which they occur mean that a single research centre could do little on its own. Therefore, the new centre will operate in a highly decentralized fashion, with geographic nodes functioning as continental coordinators. Many activities will take place through multiple-participant networks operating on a global scale as well as through collaborative research arrangements. The new centre will address strategic research needs in the areas of watershed management; management, ecology, and conservation of natural forests; tree selection, genetic improvement, and establishment; utilization and marketing of forest products (including non-timber forest products); and forest policy and economics.

The new centre will require staff in the near future. In addition, the decentralized, networking mode of operation is expected to provide many opportunities for collaboration. Implementation is ongoing and the situation is quickly changing. Those interested in learning more are encouraged to contact ACIAR for more information.

International Center for Agricultural Research in the Dry Areas

Established: 1975
Budget: 25 million USD
Staff: 68 senior positions
Director General: Dr Nasrat Fadda
Address: PO Box 5466, Aleppo, Syria
Telephone: (963-21) 21-34-33, 21-34-77, 23-48-90
Telex: (0492) 331206 ICARDA SY,
(0492) 331263 ICARDA SY
Contact: Dr Nasrat Fadda, Director General

Mandate

The International Center for Agricultural Research in the Dry Areas (ICARDA) was established to develop sustainable improvements in the production of dryland cereals, food legumes, pasture, forage, and livestock. The Center has an international mandate for barley, faba bean, and lentil production; a regional mandate for bread wheat and durum wheat improvement, in association with CIMMYT (see p. 18); and a regional mandate for chickpea improvement, in association with ICRISAT (see p. 20). ICARDA has been increasingly focusing on sustainable production and conserving the resource base of the Mediterranean ecosystems.

Program

ICARDA addresses its mandate through seven "integrative activity packages": Agroecological Characterization; Germ-Plasm Conservation; Germ-Plasm Enhancement; Resource Management and Conservation; Training; Information Dissemination; and Impact Assessment and Enhancement (which examines issues such as agricultural labour and technological change).

ICARDA maintains a 940-hectare research station and headquarters, equipped with 41 active laboratories. There are local support offices in

Damascus and Beirut, research sites in Syria and Lebanon, and regional program offices in Amman, Cairo, Ankara, Tunis, and Quetta (Pakistan).

Opportunities for Visiting Scientists

ICARDA provides many opportunities for collaboration with visiting Canadian scientists:

- Cereal crops: barley breeding; barley quality; breeding barley or wheat for improved tolerance to drought, cold, or heat; wheat and barley pathology.
- Food legume crops: dihaploid production in lentil and chickpea; evolutionary genetics in chickpea; mechanism of host-plant resistance to chickpea leaf miner; biological control of *Sitona crinitus* in lentil; mechanism of frost and drought resistance in chickpea and lentil; antinutritional factors in food and feed legumes.
- Pasture, forage, and livestock: development of annual legume pasture and cereal rotations; improvement of marginal land and rangeland; collection, characterization, and evaluation of annual pasture legumes, especially medicagos; intake and nutritive value of forages and crop residues, including the effects of antinutritional factors; improvement of nutrition and management of small ruminant flocks; incidence of gut and lung parasites; synergy between viruses and lungworms in respiratory disorders.
- Farm resource management: studies of farming systems; development and impact of new technology, including risk, gender, and sustainability issues; agroecological characterization for targeted resource-management strategies; modeling of weather, crop growth, and soil erosion; nutrient dynamics in Mediterranean soil, crop, and livestock systems; supplemental irrigation; new crops, especially oilseeds; land management, soil conservation, and water harvesting.

International Center for Living Aquatic Resources Management

Established:	1977
Budget:	4 million USD
Staff:	80
Director General:	Dr Kenneth MacKay
Address:	MC PO Box 1501, Makati, Metro Manila, Philippines
Fax:	(63-2) 816-3183
Telephone:	(63-2) 818-0466, 818-9283, 817-5255, 817-5163
Contact:	Dr Kenneth MacKay, Director General

Mandate

The International Center for Living Aquatic Resources Management (ICLARM) conducts and assists others to conduct research on the production, management, preservation, distribution, and utilization of fish and other aquatic organisms, for the sustainable benefit of low-income producers and consumers in developing countries. Emphasis is given to small-scale, rural, subsistence, and market fisheries, and to improving the efficiency and productivity of culture and capture fisheries.

Program

The research program of ICLARM is organized into three areas. First, Resource Conservation and Management focuses on methodologies for capture fisheries management, including ecosystem and environmental concerns and habitat conservation. Second, Fish Productivity emphasize germ-plasm enhancement, germ-plasm breeding, and the development of low-cost farming systems. Current research is on tropical freshwater finfish and marine bivalve molluscs. Third, Social Sciences and Policy addresses issues of gender, equity, institutions, intersectoral linkages, markets, and development and management policies.

Headquarters and modest research facilities are maintained in Manila and a Coastal Aquaculture Center is in operation in the Solomon Islands. Regional offices are planned for Africa and Latin America.

Opportunities for Visiting Scientists

Researchers from both developing and developed countries visit ICLARM for periods ranging from days to years. They include predoctoral and postdoctoral fellows, researchers on sabbatical, scientists wishing to become familiar with ICLARM methodologies, and those involved in research projects with ICLARM. For a short visit, space can usually be provided on short notice. Longer visits require careful planning to ensure availability of both staff and space.

International Center for Research in Agroforestry

Established:	1977
Budget:	14.5 million USD
Staff:	85 senior members
Director General:	Dr Pedro Sanchez
Address:	PO Box 30677, Nairobi, Kenya
Fax:	(254-2) 521-001
Telephone:	(254-2) 521-450
Telex:	22048 ICRAF
Contact:	Dr Pedro Sanchez, Director General

Mandate

The mandate of the International Council for Research in Agroforestry (ICRAF) is to increase the economic and nutritional well-being of people in developing countries through the integration of woody perennials into farming and related land-use systems, achieving higher productivity, sustainability, and diversity of output. The Council's goal is to initiate and assist in generating and disseminating appropriate agroforestry technologies for use by farmers.

Program

ICRAF's activities are organized into two programs: Research and Dissemination. The Research Program is organized into four major subprograms: Agroforestry and Land-Use Systems, Component Interactions in Agroforestry Systems, Multipurpose Tree Improvement for Agroforestry Systems, and Agroforestry Policy and Institutional Issues. Each of these four subprograms integrates strategic, applied, and adaptive research. This research is carried out at ICRAF or through a series of networks of national programs known as AFRENAs (Agroforestry Research Networks for Africa). Also, to a greater degree than many of the other IARCs, ICRAF puts a major emphasis on dissemination.

In addition to ICRAF's headquarters in Nairobi, a 40-hectare field station is located at Machakos, about 70 kilometres from Nairobi. Field trials and experiments are also conducted in western Kenya and Southern and East Africa. The majority of research, however, is carried out through national programs on their field sites and on farms.

Opportunities for Visiting Scientists

ICRAF is currently in a period of expansion. Requirements are anticipated for specialists in a diversity of fields, in both biophysical research and in information dissemination. Many of these requirements could be met initially by visiting scientists.

International Center for Tropical Agriculture

Established:	1967
Budget:	28.8 million USD
Staff:	82 senior members
Director General:	Dr Gustavo Nores
Address:	Apartado Aéreo 6713, Cali, Colombia
Fax:	(57-23) 647-243
Telephone:	(57-23) 675-050
Telex:	396-05769 CIAT CO

Contact: Germ-plasm development:
Dr Douglas R. Laing, Deputy Director General
Natural resource management:
Dr Filemon Torres, Deputy Director General

Mandate

The research of the International Center for Tropical Agriculture (CIAT) pursues two integrated thrusts: germ-plasm development and natural resource management.

In germ-plasm development, CIAT has global responsibility for the improvement of the common bean (*Phaseolus vulgaris*), with secondary emphasis on snap beans; for cassava; and for tropical forages in relation to acid, infertile soils found between sea level and 1 800 metres above sea level. For rice, CIAT has regional responsibility for Latin America and the Caribbean. CIAT plans to assume secondary responsibility for soybeans and sorghum, limited to exploring the potential of these crops as components in production systems for acid, infertile soils, particularly in the savanna agroecosystem. The focus of CIAT in germ-plasm development is to produce high yields under various environmental constraints with low use of purchased inputs, particularly pesticides.

In natural resource management, CIAT is responsible for tropical America. Land-use research emphasizes land-use strategies and policy alternatives. Agroecosystems research in cleared forest margins and hillsides with moderately acid, low-fertility soils emphasizes integration into sustainable farming systems.

Program

CIAT addresses its mandate through nine research programs.

Four commodity programs — Beans, Cassava, Rice, and Tropical Forages — carry out germ-plasm development. They concentrate on improving the parental population to obtain stable genetic resistance to important diseases and pests, and tolerance to drought and soil conditions. They also develop technology to increase crop production and utilization, with a focus on biological pest control and integrated pest management.

The natural resource management work is contained within four more programs: Land Use, Hillsides, Forest Margins, and Savannas. This research

aims at improving the management of resources available for agriculture in tropical America, such that gains in outputs are sustainable and compatible with long-term preservation of the resource base. The main strategy is to develop alternative land-use strategy and policy options and to integrate these into sustainable farming systems, helping to relieve market and social pressures on the most fragile and threatened environments.

The germ-plasm development and resource management efforts are supported by several research support units concentrating on genetic resources, biotechnology, virology, and geographic information systems.

The Institutional Development Program assists the research programs in strengthening the capacity and increasing the efficiency of national and regional research systems to contribute to sustainable agriculture. This includes developing suitable seed supply systems for small farmers and enhancing national and regional training in commodity production and adaptive research.

CIAT maintains its headquarters in Cali, Colombia, and four substations located in different edaphoclimatic regions in rural Colombia. It also has outposted staff in other South and Central American countries, as well as in Asia (cassava and tropical forages) and Africa (beans and cassava, with IITA, see p. 23)

Opportunities for Visiting Scientists

CIAT has a strong interest in collaboration in advanced research projects in biotechnology, plant physiology, and plant genetics. In plant genetics, emphasis is on germ-plasm characterization, particularly genome mapping of *Phaseolus* and *Manihot* and the anatomy, morphology, and taxonomy of tropical pastures legumes such as *Centrosema*, *Stylosanthes*, *Desmodium*, *Arachis*, and multipurpose trees and shrubs. Acid soil chemistry and nutrient dynamics, soil–plant relations, land-use policies and strategies, and farmer participatory research are of major interest to CIAT. Scientists are encouraged to explore other possibilities directly with CIAT.

International Centre for Maize and Wheat Improvement

Established:	1966
Budget:	32.4 million USD
Staff:	92 senior members
Director General:	Dr Donald Winkelmann
Address:	Lisboa 27, Apartado Postal 6-641, 06600 Mexico, Mexico
Fax:	(52-595) 4-1069
Telephone:	(52-5) 761-3311, (52-595) 4-2100
Telex:	1772023 CIMTME
Contact:	Dr Donald Winkelmann, Director General

Mandate

The International Centre for Maize and Wheat Improvement (CIMMYT) has a global mandate for the improvement of maize, wheat, and triticale, as well as related economic and crop-management research. The Centre sees its mission as improving the productivity of the resources devoted to these crops, whether in research or on the farm.

Program

CIMMYT's research is organized into three main programs: Maize, Wheat, and Economics.

The Maize Program focuses on breeding improved varieties of lowland tropical, midaltitude, and highland maize. This effort is supported by work on physiology (with an emphasis on drought tolerance), entomology, agronomy, wide crosses, and pathology. CIMMYT maintains a collection of the maize genetic resources of the Western Hemisphere.

The Wheat Program focuses on breeding improved varieties of spring bread wheat, spring durums, and spring triticale. Some bread wheat research resources are also allocated to spring × winter crosses, to winter wheats, and to materials adapted to warmer environments. This research is supported by work on pathology (with a heavy emphasis on the three rusts of wheat), agronomy, physiology, and wide crosses. CIMMYT shares global responsibility for the conservation of wheat germ plasm with ICARDA (see p. 11).

The Economics Program develops methods and provides information and analyses to improve the effectiveness and efficiency with which national programs and CIMMYT conduct research. Three areas of work comprise the Program's main activities: technology design and evaluation, research resource allocations and impacts, and macrolevel research focused on broad economic and institutional circumstances.

CIMMYT operates four research stations in Mexico; a fifth, near Ciudad Obregon in northwest Mexico, is operated by the Mexican government but used extensively by the Wheat Program. The Centre also uses several additional experimental sites around the country. Approximately one-third of the senior scientific staff are posted in 15 field offices in Central and South America, the Middle East, Africa, and South and Southeast Asia. These outreach offices tend to be more involved in applied research and liaison activities with national programs in their respective regions.

Opportunities for Visiting Scientists

Of all the IARCs, CIMMYT has the longest and most active history of collaboration with Canadian researchers. Opportunities in the Wheat Program for visiting scientists include studies in the following areas:

- Wheat virology (screening for biotypes of barley yellow dwarf virus and other cereal viruses);
- New techniques for analyzing G × E as revealed in multilocation trials data;
- Extreme earliness in wheat;
- Genetic and histopathological aspects of partial resistance to leaf, yellow, and stem rusts;
- Zero tillage and sustainability of wheat farming systems in the highlands of Mexico;
- Drought resistance in durum wheat; and
- Genetics of aluminum tolerance and of resistance to *Helminthosporuim sativum* in wheat through monosomic analysis.

Many opportunities also exist in the Maize and Economics programs.

International Crops Research Institute for the Semi-Arid Tropics

Established:	1972
Budget:	29.5 million USD
Staff:	110 senior members
Director General:	Dr J. Ryan
Address:	Patancheru PO, Andhra Pradesh, 502324, India
Fax:	(91-842) 241239
Telephone:	(91-842) 224016
Telex:	422203 ICRI IN, 4256366 ICRI IN
Contact:	Dr J. Ryan, Director General

Mandate

The mandate of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) can be broken down into four thrusts:

- Serve as the world centre for the improvement of grain yield and quality of sorghum, millet, chickpea, pigeon pea, and groundnut, and act as the world repository for the genetic resources of these crops;
- Develop improved farming systems that will help to increase and stabilize agricultural production through more effective use of natural and human resources in the seasonally dry, semi-arid tropics;
- Identify constraints to agricultural development in the semi-arid tropics and evaluate means of alleviating them through technological and institutional changes; and
- Assist in developing and transferring technology to the farmer by cooperating with national and regional programs, sponsoring workshops and conferences, providing training programs, and assisting extension activities.

Program

ICRISAT's research program is organized around its five mandate crops: sorghum, millet, chickpea, pigeon pea, and groundnut. Multidisciplinary research is aimed principally at genetic improvement of these crops: drought,

light, and temperature tolerance; disease and insect resistance; and yield improvement. Research is being carried out on grain and food quality in sorghum and pulses, and on nutrition-related aspects of chickpea and pigeon pea. Also, through its Resource Management Program, ICRISAT is working to develop cultivation methods that make maximum use of human and animal resources and the limited rainfall of the semi-arid tropics.

In addition to its headquarters and research centre near Hyderabad, India, ICRISAT has scientific staff posted in six countries of Africa, in Mexico, in Syria, and at five cooperative research stations in India. The ICRISAT Sahelian Center is located at Sadoré, near Niamey, Niger. It serves as the West African base for the development of pearl millet and groundnut and for the development of farming systems to sustain these and other crops in the Sahelian environment of erratic rainfall and low soil fertility.

Opportunities for Visiting Scientists

ICRISAT offers a wide range of opportunity for visiting scientists. Disciplines of widest interest include cell biology, plant breeding, plant physiology, plant pathology, entomology, virology, agronomy, and soil science.

International Food Policy Research Institute

Established:	1975
Budget:	12.5 million USD
Staff:	45 senior members
Director General:	Dr Per Pinstrup-Andersen
Address:	1200 Seventeenth Street N.W., Washington, DC 20036-3097, USA
Fax:	(202) 467-4439
Telephone:	(202) 862-5600
Telex:	440054
Contact:	Dr Per Pinstrup-Andersen, Director General

Mandate

The mandate of the International Food Policy Research Institute (IFPRI) is to identify and analyze alternative national and international strategies and policies for meeting the food needs of the world, with particular emphasis on low-income countries and the poorer groups within those countries. The research effort of IFPRI extends beyond a narrowly defined food sector. It reflects worldwide interaction with policymakers, administrators, and others concerned with increasing food production and improving the equity of food distribution.

Program

IFPRI is unique among the IARCs. It conducts research on the world food problem through an integrated approach examining the interrelationships between technological change, agricultural growth, overall economic growth, and social welfare. IFPRI's research is organized into five divisions: Environment and Production Technology, Markets and Structural Studies, Food Consumption and Nutrition, Trade and Macroeconomics, and Special Development Studies. IFPRI conducts virtually all of its field-based research in partnership with developing-country institutions; it also undertakes joint research with other CGIAR centres, developed-country institutions, and multilateral agencies.

Opportunities for Visiting Scientists

As a policy research institute, IFPRI has no laboratories or specialized facilities. Opportunities exist for collaboration with researchers in academic institutions. Interested scientists should contact IFPRI's Director General.

International Institute of Tropical Agriculture

Established:	1967
Budget:	23.5 million USD
Staff:	180 senior positions
Director General:	Dr Lukas Brader
Address:	Oyo Road, PMB 5320, Ibadan, Nigeria
Fax:	(234-1) 6106509, (229) 301466 (IITA, Cotonou)
Telephone:	(234-22) 40-03-00 to 17 (18 lines)
Telex:	31417 TROPIB NG/23011, TDS IBA NG (Box 015)
Contact:	Dr Lukas Brader, Director General

Mandate

The mandate of the International Institute of Tropical Agriculture (IITA) covers sub-Saharan Africa, focusing on the lowland tropics of West and Central Africa. It works toward four principal objectives:

- To develop systems for the management and conservation of natural resources for sustainable agriculture in the humid and subhumid tropics;
- To improve the performance of selected food crops that can be integrated into improved and sustainable production systems;
- To strengthen national agricultural research capabilities to accelerate the generation and utilization of improved technologies by means of training, information, and other outreach activities; and
- To improve the quality, storage, processing, and marketing of food to encourage more efficient use of available food supplies.

Program

IITA's research is organized into five multidisciplinary programs. The Resource and Crop Management Program emphasizes farming systems with major IITA crops and soil resources. The Root, Tuber, and Plantain Improvement Program focuses on cassava, yam, and plantain. The Grain Legume Improvement Program focuses on cowpea and soybean. The Biological Control Program emphasizes integrated pest management on cassava mealy bug, cassava green mite, locusts and grasshoppers, grain and

stem borers, cowpea pests, banana weevils, and weeds. Within the commodity programs, research focuses on breeding, pest management, and postharvest aspects. Research support units include Genetic Resources, Virology, Biometrics, Analytical Services, and Farm Management.

In addition to IITA headquarters, which are situated on a 1 000-hectare campus outside Ibadan, IITA maintains a humid coastal-zone research station at Onne, in southern Nigeria, and a dry savanna-zone station at Kano, in northern Nigeria. The Biological Control Program is housed at a substation at Cotonou, Republic of Benin, and a high-rainfall, humid-forest station is being established at Mbalmayo in Cameroon. Eight major collaborative projects are underway in West, Central, and Southern Africa.

Opportunities for Visiting Scientists

IITA is a relatively large IARC, presenting a wide range of potential opportunities in an equally wide range of disciplines. Canadians interested in exploring this potential are encouraged to contact IITA directly.

International Irrigation Management Institute

Established:	1984
Budget:	8.5 million USD
Staff:	30 senior members
Director General:	Dr Roberto Lenton
Address:	PO Box 2075, Colombo, Sri Lanka
Fax:	(94-1) 562919
Telephone:	(94-1) 565601
Contact:	Dr Roberto Lenton, Director General

Mandate

The mandate of the International Irrigation Management Institute (IIMI) is to strengthen national efforts to improve and sustain the performance of irrigation systems in developing countries. This mandate is fulfilled through the development and dissemination of management innovations.

Program

IIMI uses two methods to achieve it mission: collaborative field research and thematic research. The collaborative field research is undertaken in over a dozen countries of Asia and Africa; the thematic research is mainly conducted at the Institute's Colombo headquarters. The two methodologies are integrated into a program consisting of six themes: Performance of Irrigation Systems, Management of Water for Irrigation, Management of Irrigation Organizations, Institutional Change and Policies, Farmers and the Farming Community, and Environment.

All research involves multidisciplinary teams focusing on current, tangible issues, for example:

- Ways to measure irrigation performance and so judge the effectiveness of management changes by objective standards, as well as allow valid comparisons on the basis of agreed benchmarks;
- Hypotheses about cause and effect in irrigation management that can be objectively tested;
- Methods for analyzing the interaction between irrigation system design and management;
- Openness for change and performance orientation on the part of irrigation agencies; and
- Appropriate applications of management principles and practices to the management of irrigations systems.

In addition to its headquarters in Colombo, IIMI has 10 field offices: 5 in Asia and 5 in Africa. Work in Latin America will begin in 1992.

Opportunities for Visiting Scientists

IIMI welcomes visiting scientists in a variety of ways. Currently, eight scientists from industrialized countries are working at IIMI on staff secondments, as government-sponsored young professionals, or as pre- and post-doctoral fellows sponsored by a government or another donor. Over the next decade, the Institute hopes to increase its number of visiting scholars and scientists. To this end, IIMI has retained flexible personnel policies that maximize opportunities for a range of possible relationships.

Priority research areas in which visiting scientists would be particularly welcomed include the interrelation between irrigation and the environment,

the role of women in irrigation, and the economic impacts of irrigation management practices.

International Laboratory for Research on Animal Diseases

Established:	1973
Budget:	13.5 million USD
Staff:	60 senior members
Director General:	Dr A.R. Gray
Address:	PO Box 30709, Nairobi, Kenya
Fax:	(254-2) 59-34-99
Telephone:	(254-2) 59-23-11
Telex:	963-22040
Contact:	Dr A.R. Gray, Director General

Mandate

The mandate of the International Laboratory for Research on Animal Diseases (ILRAD) is to develop safe, effective, and economical control measures for those livestock diseases seriously limiting world food production. The Laboratory's research and training activities concentrate on immunological and related aspects of two diseases: a virulent form of theileriosis — East Coast fever (ECF) — and African animal trypanosomiasis.

Program

The research of ILRAD is organized into three main programs. Within the Theileriosis Research Program, ECF research is concentrated in three interrelated areas: vaccine development against the sporozoite stage of the parasite, development of a schizont vaccine, and epidemiological studies and field trials. The Trypanosomiasis Research Program is broadly based in three subject areas: trypanosome antigenicity and biochemistry, host resistance, and trypanosome epidemiology and vector studies. An Epidemiology and Socioeconomics Unit has been established to identify factors that

govern the successful application of improved disease-control measures — particularly the widespread use of immunization — and to assess the likely impact of improved disease control in epidemiological, economic, social, and environmental terms.

Facilities at ILRAD, located on a 70-hectare site 15 kilometres from downtown Nairobi, comprise veterinary research laboratories, electron microscopy, radioisotope and irradiation facilities, a scientific library, and breeding units for lab animals, tsetse flies, and ticks. ILRAD also operates a 13000-hectare ranch outside of Nairobi where a large breeding herd of Boran is kept.

Opportunities for Visiting Scientists

ILRAD provides opportunities for scientists with expertise in the areas of endocytosis and metabolism in protozoa; transfection technology for parasites and mammalian cells; culture systems supporting haemopoietic cell differentiation; cell-mediated immunity and immunochemistry; and veterinary epidemiology and genetics of disease resistance.

International Livestock Centre for Africa

Established:	1974
Budget:	20.2 million USD
Staff:	66 senior members
Director General:	Dr John Walsh
Address:	PO Box 5689, Addis Ababa, Ethiopia
Fax:	(251-1) 611892
Telephone:	(251-1) 613215
Telex:	21207 ILCA ET
Contact:	Dr H. Fitzhugh, Deputy Director General (Research)

Mandate

The International Livestock Centre for Africa (ILCA) assists national efforts to improve livestock production and marketing systems in tropical Africa,

increasing the sustained yield and output of livestock products, thereby improving the quality of life of the people in this region. The Centre aims to strengthen the ability of national programs to conduct technical and policy research in livestock-related fields, thus developing their own technical solutions to livestock production and marketing problems. It also aims to promote livestock and rural development, and to develop, through its own research and that of other organizations, technologies for increasing both livestock output and the contribution of livestock to sustainable agricultural production and income.

Program

ILCA's research program covers six major areas: cattle milk and meat, small ruminant meat and milk, animal traction, animal feed resources, trypanotolerance, and livestock policy and resource use. The first three are aimed at increasing the output of milk, meat, and traction in sub-Saharan Africa. The second three are strategic, supporting the commodity thrusts by providing inputs of information or technology. Each thrust is multidisciplinary and multilocational, involving work at several sites representing different zones and regions of tropical Africa.

ILCA has a nutritional laboratory equipped with gas chromatography and high-performance liquid chromatography, and an animal husbandry and breeding laboratory equipped for routine tests in biochemistry, immunochemistry, clinical bacteriology, haematology, histopathy, and hormone assays. To study local agricultural practices, research sites have been established in pertinent agroecological zones throughout tropical Africa.

Opportunities for Visiting Scientists

At ILCA, areas of opportunity for visiting expertise include

- Feeding strategies for multiple-purpose cattle production (milk, meat, and draft);
- Genetic improvement of cattle, sheep and goats under adverse environmental conditions (climate, disease, etc.);
- Genetic resources, agronomy, and utilization of multiple-purpose trees for feed, fertilizer, and fuel;
- Policy studies dealing with the sustainable management of national resources; and

- Economic assessment of costs and benefits of technologies developed by ILCA and national programs to improve livestock productivity (feeding systems, health management, genetic-improvement schemes, etc.).

International Network for the Improvement of Banana and Plantain

Established:	1984
Budget:	2.5 million USD
Director:	Dr Nicolas Mateo
Address:	Parc Scientifique Agropolis, Bat 7 – Boulevard de la Lironde, 34980 Montferrier-sur-Lez, France
Fax:	(33) 67-61-03-34
Telephone:	(33) 67-61-13-02
Contact:	Dr Nicolas Mateo, Director

Mandate

The general objective of the International Network for the Improvement of Banana and Plantain (INIBAP) is to increase the productivity and stability of banana and plantain grown on smallholdings. Specific objectives include the following:

- To initiate, encourage, support, conduct, and coordinate research aimed at improving the productivity of banana and plantain;
- To strengthen national and regional programs and facilitate the interchange of improved and disease-free genetic material by assisting in the establishment and analysis of regional and global trials of new and improved cultivars;
- To coordinate and support the collection and exchange of documentation and information related to banana and plantain; and
- To coordinate and support training for researchers and technicians from developing countries.

Program

INIBAP differs considerably from other CGIAR centres in that it does not have a large central research facility. Bananas and plantains occur in a multitude of forms and have many different uses throughout the world. As such, there is no obvious, choice location for a global research centre on banana and plantain (*Musa* spp.). Instead, international support for INIBAP's *Musa* program is organized through a network approach using research facilities in developed and, particularly, in a range of developing countries. Most of INIBAP's research is carried out in national and regional programs.

The two global research thrusts of INIBAP are the Germ-Plasm Program (taxonomy, germ-plasm exchange, germ-plasm evaluation, germplasm improvement, and the international *Musa*-testing program) and the Pathology Program (focusing on black sigatoka, *Fusarium* wilt, and banana bunchy top virus). Regional thrusts respond to regional needs and requests and include, in some regions, pests such as nematodes and weevils. Support activities such as information/documentation and training are also important to INIBAP's program. At the heart of INIBAP's operations are its four regional networks: Latin America and the Caribbean, West and Central Africa, East Africa, and Asia and the Pacific.

A small staff works out of the Montpellier headquarters, and the coordinators of the regional research and information/documentation networks are located in the regions.

Opportunities for Visiting Scientists

INIBAP's emphasis on networking provides considerable opportunity for collaboration. Scientists with particular skills to share and with an interest in the regional networks should contact INIBAP directly.

International Plant Genetic Resources Institute

Established:	1974
Budget:	8.1 million USD
Staff:	39 senior members
Director General:	Dr Geoffrey C. Hawtin
Address:	c/o Food and Agriculture Organization of the United Nations, Via delle Sette Chiese 142, 00145 Rome, Italy
Fax:	(39-6) 914-6172
Telephone:	(39-6) 574-4719
Telex:	4900005332 (IBR UI)
Contact:	Dr Alison McCusker, Head, Research Program

Mandate

The mandate of the International Plant Genetic Resources Institute (IPGRI) is to further the study, collection, preservation, documentation, evaluation, and utilization of the genetic diversity of useful plants for the benefit of people throughout the world.

Program

A major part of IPGRI's work is in coordinating and supporting germ-plasm conservation. This is carried out by the Field Program through the Institute's regional offices and a developing series of crop networks. Major areas of activity are support to national programs; characterization, directories, and catalogues of germ-plasm collections; and international crop databases.

The objective of IPGRI's Research Program is to improve the scientific and technical bases for collecting, conserving, and describing genetic resources. This is done by addressing priority problems through an interdisciplinary approach. The Institute supports four main areas of research: seed conservation, *in vitro* conservation, genetic diversity, and regeneration and evaluation. Some current objectives are to develop safer and more cost-effective methods of long-term seed storage, to improve *in vitro* technology for preserving and recovering germ plasm, to develop indexing methods for detecting viral pathogens, and to improve knowledge of the ecogeographic

and taxonomic structures of gene pools. The Program comprises research on crop and forage species and their wild relatives and, with the decision to incorporate forestry within the purview of the CGIAR, will be expanded to include important forest species.

IPGRI does not have any laboratory or field facilities; it works in collaboration with national, regional, and international centres. In addition to its headquarters in Rome, IPGRI has regional offices in China, Colombia (at CIAT, see p. 15), India, Kenya (at ILRAD, see p. 26), Mexico (at CIMMYT, see p. 18), Niger (at ICRISAT Sahelian Center, see p. 20), and the Philippines, and seed-handling units in the Republic of Singapore and the United Kingdom (Kew).

Opportunities for Visiting Scientists

A considerable part of IPGRI's work involves information management. Areas where IPGRI could utilize visiting expertise include species mapping, linking with environmental data bases, computerized documentation, and the development of standard packages for national genetic resources programs. There are also many opportunities for scientists interested in research related to genetic resources.

International Potato Center

Established:	1970
Budget:	18.2 million USD
Staff:	75 senior members
Director General:	Dr Hubert G. Zandstra
Address:	Apartado Aéreo 5969, Lima, Peru
Fax:	(51-14) 351570, 350842
Telephone:	(51-14) 350266, 350842 (Office of the Director General); (51-14) 366920
Telex:	(394) 25672 PE
Contact:	Dr Hubert G. Zandstra, Director General

Mandate

The International Potato Center (CIP) conducts research to solve priority problems that limit potato and seed potato production and consumption in developing countries. This includes adapting the collective knowledge existing in the industrialized countries as well as pertinent postharvest research.

Program

CIP organizes its research into six departments: Breeding, Genetics, Genetic Resources, Nematology, Entomology, and Social Sciences. Within each department, there are six research thrusts: production systems, germ-plasm management and enhancement, disease management, insect and nematode management, propagation crop management, and postharvest management and marketing.

CIP places a strong emphasis on helping national agricultural research systems develop their own research programs. To facilitate this, CIP has a highly decentralized character, with regional offices throughout the developing world and a series of five regional research networks involving a total of 32 countries. An interdisciplinary approach to research is stressed.

Opportunities for Visiting Scientists

With such a high degree of decentralization, many potential opportunities exist for specialists in the social sciences, geographic information systems, pathology, and biotechnology. CIP maintains the World Potato Collection, the largest bank of potato germ plasm in the world (including 6500 identified varieties).

International Rice Research Institute

Established:	1960
Budget:	30.6 million USD
Staff:	90 senior members
Director General:	Dr K. Lampe
Address:	PO Box 933, Manila, Philippines
Fax:	(63-2) 817-8470
Telephone:	(63-2) 818-1926
Telex:	45365 RECE INST PM or (ITT), 22456 IRI PH (RCA)
Contact:	Dr K. Lampe, Director General

Mandate

The goal of the International Rice Research Institute (IRRI) is to improve the well-being of current and future generations of rice farmers and consumers, particularly those with low incomes. Its objectives are to generate and disseminate rice-related knowledge and technology of short- and long-term environmental, social, and economic benefit, and to help enhance national rice research systems in developing countries.

Program

IRRI research programs centre on the world's major rice-growing ecosystems, with the Cross-Ecosystems Program spanning the environments. There are five research programs: Cross-Ecosystems, Irrigated Rice, Rainfed Lowland Rice, Upland Rice, and Deepwater/Tidal Wetlands Rice. In each Program, interdisciplinary scientific teams work to solve critical rice-production problems. Discipline-based divisions include Social Sciences; Plant Breeding, Genetics, and Biochemistry; Plant Pathology; Entomology; Agronomy, Physiology, and Agroecology; Soil and Water Sciences; Soil Microbiology; and Agricultural Engineering.

IRRI's headquarters are located next to the campus of the University of the Philippines at Los Baños. Also, many IRRI staff are outposted with national programs.

Opportunities for Visiting Scientists

There are currently many opportunities at IRRI for collaboration with visiting scientists. Areas of opportunity include

- Yield loss relations to develop multiple pest stress thresholds;
- Biology and ecology of upland rice insect pests (mole, cricket, white grubs, root aphids, or *Atherigona* seedling maggots);
- Population dynamics of biocontrol agents to rice diseases;
- Mass production of antisera against rice tungro virus;
- Utilization of monoclonal antibodies to rice diseases;
- Environmental impact of new rice technologies;
- Wide hybridization for rice improvement; and
- Engineering for low-input sustainable agriculture.

International Service for National Agricultural Research

Established:	1980
Budget:	8.5 million USD
Staff:	36 senior members
Director General:	Dr C. Bonte-Friedheim
Address:	PO Box 93375, 2509 AJ The Hague, Netherlands
Fax:	(31-70) 381-9677
Telephone:	(31-70) 349-6100
Telex:	844-33746
Contact:	Dr C. Bonte-Friedheim, Director General

Mandate

The International Service for National Agricultural Research (ISNAR) was established to strengthen the agricultural research of developing countries. On request, ISNAR provides advice to governments on policy, organization, and management issues in agricultural research.

Program

Unlike most of the other CGIAR centres, ISNAR does not conduct agricultural research. Rather, depending on the nature of the request received, ISNAR either examines specific aspects of a national agricultural research system or conducts a comprehensive diagnostic review of the entire system. In some cases, assistance is also provided in designing and implementing a corrective action plan. ISNAR's advisory service is supported by in-house programs of management research and training. ISNAR's budget is allocated into four general areas: advisory services (40%), research (25%), training (15%), and program support and administration (20%). Priority is given to Africa, to which about half of ISNAR's resources are devoted.

Research is typically conducted in the fields of systems organization and structure, personnel management, research program planning and priority setting, and research policy and information management systems. Major projects of ISNAR have included a book on agriculture research indicators, a continuing study of on-farm, client-oriented research, an examination of case studies in the linkages between research and technology transfer, and a book on agricultural research policy. A technical report examining issues in biotechnology was also recently completed for use by policymakers.

To provide accessible information, ISNAR houses a specialized library containing 15000 documents pertaining to the issues of research policy, organization, and management.

Opportunities for Visiting Scientists

The diversity of activities undertaken by ISNAR provides a wide potential for collaboration. Those interested in any of its activities are encouraged to contact ISNAR directly.

West Africa Rice Development Association

Established:	1970
Budget:	6.9 million USD
Staff:	32 senior members
Director General:	Dr Eugene Terry
Address:	01 BP 2551, Bouaké 01, Côte d'Ivoire
Fax:	(225) 63-47-14
Telephone:	(225) 63-45-14, 63-23-96
Telex:	69138 ADRAO CI
Contact:	Dr Eugene Terry, Director General

Mandate

The West Africa Rice Development Association (WARDA) conducts and promotes research to improve the technical and economic options available to smallholder rice farmers of West Africa, its main target group.

Program

To fulfil its mandate, the research program of WARDA has the following objectives:

- Develop management techniques to reduce unit production costs on a sustainable basis;
- Develop higher yielding and more stable rice varieties;
- Increase the acceptability and impact of new rice technology;
- Formulate national policy options for rice; and
- Develop economic means of reducing postharvest losses.

The constraints to rice production and the needs for technical change vary according to the diverse ecosystems and farming systems in which rice is cultivated in West Africa. Therefore, WARDA has organized its research on an ecosystem basis, targeting three major rice-growing environments: the Upland/Inland Swamp Continuum Program, the Sahel Program, and the Mangrove Swamp Program. Research within each Program is organized around a limited number of projects that are tackled by interdisciplinary teams.

WARDA maintains research stations in each of the major rice-growing environments. The Upland/Inland Swamp Continuum Program is located at WARDA's Côte d'Ivoire headquarters. The Sahel Program is currently located near St Louis, Senegal. The Mangrove Swamp Program is stationed at Rokupr, Sierra Leone. WARDA also closely integrates on-station and on-farm research.

Opportunities for Visiting Scientists

WARDA will host a limited number of visiting reséarchers for periods ranging from 3 months to 1 year, depending on the nature of the research. One purpose of WARDA's visiting scientist program is to help build cooperative linkages with specialized institutions outside of West Africa. Research coordinated by visiting scientists permits specialized skills to be focused on areas of common interest. Visiting scientists are normally selected on a competitive basis and their research proposals are considered on the basis of scientific merit and their correspondence to WARDA's research priorities. WARDA provides office, laboratory, and field space as well as essential logistical support during the visiting scientists' tenure. Additional support can be negotiated with the scientist and his or her home institution.

THE INDEPENDENT CENTRES

Asian Vegetable Research and Development Center

Established:	1971
Budget:	9.4 million USD
Staff:	350
Director General:	Dr Emil Q. Javier
Address:	PO Box 205, Taipei 10099, Taiwan
Fax:	(886-6) 583-0009
Telephone:	(886-6) 583-7801
Telex:	73560 AVRDC
Contact:	Dr Emil Q. Javier, Director General

Mandate

The Asian Vegetable Research and Development Center (AVRDC) has a global mandate for research and development of vegetable crops in the tropics.

Program

The research of AVRDC is organized around two major programs: the Crop Improvement Program and the Production Systems Program. The Crop Improvement Program focuses on the breeding, entomology, pathology, and physiology of three vegetable groups: tomato, peppers, and eggplant; onion, shallot, and garlic; and common cabbage and Chinese cabbage. It includes a Genetic Resources and Seed Unit. The Production Systems Program encompasses research on crop environment, including crop management, cropping systems, soil science, and socioeconomics. Other research and research-support activities include the International Cooperation Program (which has trained over 1000 people since 1971), two regional programs, Information and Library Services, and a laboratory of analytical chemistry to analyze the quality of vegetable nutrients.

Opportunities for Visiting Scientists

AVRDC cooperates with and assists national programs through resident training of researchers and extension agents. Since its establishment in 1971,

the Center has established an extensive network reaching out to the developing regions of Southeast Asia, South Asia, and Southern Africa.

Research scholars and visiting scientists are attached to Center programs in their particular discipline. They work with Center scientists in pursuing research topics of mutual interest. Visiting scientists are usually accomplished researchers on sabbatical from their home institutions.

International Board for Soil Research and Management

Established:	1983
Budget:	4 million USD
Staff:	10 senior members
Director:	Dr Marc Latham
Address:	PO Box 9-109, Bangkhen, Bangkok 10900, Thailand
Fax:	(66-2) 561-1230
Telephone:	(66-2) 579-7590, 579-4012
Telex:	21505 IBSRAM TH
Contact:	Dr Marc Latham, Director

Mandate

The International Board for Soil Research and Management (IBSRAM) is dedicated to assisting and developing applications of soil science in the interest of increasing sustainable food production in developing countries.

Program

IBSRAM acts principally as a coordinating agency. The Board has developed and manages four networks that link national agronomic research institutions in developing countries. Two of these networks are in Africa, one is in Asia, and one is in the Pacific region. IBSRAM itself has no research facilities.

The AFRICALAND network, in humid tropical Africa, studies the management of acid soils and newly cleared lands. It seeks means of sustaining soil productivity under conditions of continuous cropping. The

other African network, MOVUSAC, was established to study the management of vertisols. The network is testing surface drainage and water conservation with the objective of increasing yields on vertisols and reducing the risk of crop failure. The networks in Asia and the Pacific region — ASIALAND and PACIFICLAND, respectively — were established to develop conservation farming systems on sloping land that will be sustainable and acceptable within the cropping systems used in these regions.

Opportunities for Visiting Scientists

IBSRAM provides an excellent opportunity for collaboration with the national programs of soil research. The Board may provide administrative and office support to scientists through its Bangkok headquarters or its regional office in Abidjan. Collaboration would be valuable in the following research areas: studies of productivity factors in the soil, socioeconomic analysis of existing and proposed technologies, conditions of extension, and remote-sensing analysis of land degradation. IBSRAM is a coordinating agency; therefore, laboratory research is conducted through networks rather than at Board headquarters.

International Centre of Insect Physiology and Ecology

Established:	1970
Budget:	12.2 million USD
Staff:	50 senior members
Director:	Prof. T.R. Odhiambo
Address:	PO Box 30772, Nairobi, Kenya
Fax:	(254-2) 803-360
Telephone:	(254-2) 802-501, 802-503, 802-509, 802-510, 802-511, 802-512, 802-514, 802-519, 802-528, 802-529
Contact:	Prof. T.R. Odhiambo, Director

Mandate

The mandate of the International Centre of Insect Physiology and Ecology (ICIPE) is to undertake research on selected insects and arthropods, with special reference to Africa and other tropical regions of the world. ICIPE studies the identity, abundance, distribution, ecology, behaviour, physiology, pathology, and genetics of insects and applies this knowledge to the development of innovative technologies for ecologically and economically sustainable integrated pest and vector management, as well as to the beneficial use of insects.

Program

Research at ICIPE is organized around five core programs.

The Crop Pests Research Program seeks to contribute to a sustainable increase in food production by reducing crop losses caused by insect pests. This Program is subdivided into four sections: Integrated Pest Management and Population Biology, Plant Resistance to Insect Pests, Biological Control, and Cultural Control. Important insects under study include sorghum and maize stem borers (*Chilo partellus*, *Busseola fusca*, *Eldana saccharina*, and *Sesamia calamistis*), sorghum shootfly (*Atherigona soccata*), cowpea pod borer (*Maruca testulalis*), aphid (*Aphis craccivora*), banana weevil (*Cosmopolites sordidus*), cassava green spider mite (*Mononychellus* spp.), rice leaf folders (*Cnaphalocrocis medinalis* and *Marasmia patnalis*), and other pests of rain-fed rice.

The Livestock Ticks Research Program works to control ticks through integrated tick management packages, including the design and development of antitick vaccines.

The Medical Vectors Research Program works on various aspects of leishmaniasis epidemiology. The Program includes both field (epidemiology, vector behaviour, and reservoir studies) and laboratory research (characterization of leishmanial parasites, biochemical characterization of vectors, and parasite–host interactions).

The Tsetse Research Program investigates tsetse control strategies, with studies on trapping, population dynamics, and especially population suppression. It also works on tsetse reproductive biology, including pathogens of tsetse relationships between the disease vector and the animal host.

Finally, the Locust Research Program studies the long-term management of locust populations through biological control and the disruption of swarming behaviour.

ICIPE maintains fully equipped, modern support units at its headquarters. They include research units in chemistry and biochemistry, cell biology, sensory physiology, social science interference, and animal and insect breeding.

Opportunities for Visiting Scientists

Interested scientists should contact ICIPE directly.

International Fertilizer Development Center

Established:	1974
Budget:	14.2 million USD
Staff:	160
Acting President:	Dr Amit H. Roy
Address:	PO Box 2040, Muscle Shoals, AL 35662, USA
Fax:	(205) 381-7408
Telephone:	(205) 381-6600
Telex:	810-731-3970
Contact:	Dr Amit H. Roy, Acting President

Mandate

The International Fertilizer Development Center (IFDC) focuses on developing sustainable agricultural productivity in the world's humid and subhumid tropics and subtropics through the transfer of appropriate and environmentally sound technology involving all aspects of fertilizer production, marketing, and use.

Program

The research program of IFDC is organized around eight main thrusts, each of which are addressed by multidisciplinary task teams.

The Nutrient Characterization and Production Program specializes in the research and development of both external nutrient sources (agrominerals and other raw materials, and inorganic and organic fertilizers) and on-farm nutrient sources (plant and animal residues). The Nutrient Dynamics and Agroecosystems Program focuses on improving or maintaining crop production in a sustainable and environmentally acceptable manner through the removal or reduction of constraints to soil fertility that exist under different tropical and subtropical conditions and in diverse cropping systems. The objectives of the Information Management Systems Program are to provide, analyze, and interpret information on the effective operation of an integrated system of nutrient supply and use for researchers and clients at field, farm, national, regional, and global levels. The Economics and Policy Program conducts economic, socioeconomic, and policy research at micro- and macrolevels. The Agribusiness Program integrates supply, marketing, and use of agricultural inputs and outputs with special emphasis on plant nutrient inputs. The Environmental Assessment Program monitors systems for the production and use of plant nutrients to ensure that food production and environmental protection are attainable and sustainable. The Human Resources Development Program focuses on developing personnel from the various sectors who will become advisors and future policymakers in their respective countries. The Project Analysis and Assistance Program assesses the technical and economic aspects of new projects and institutions in sustainable agriculture.

IFDC maintains laboratory and greenhouse facilities at its Alabama headquarters and runs a West African Division in Togo. Focusing on the needs of the region, the Togo office has programs in the dissemination of plant-nutrient information and the transfer of plant-nutrient technology; policy research; agronomic research; soil-fertility restoration; indigenous agromineral research and development; monitoring, collecting, and disseminating market information; and regional collaboration and training.

Opportunities for Visiting Scientists

The emerging research thrust at IFDC is in plant nutrients and the environment. As a result, IFDC hopes to develop emission coefficients related to plant nutrients for specific crop-management systems and various agroecological zones. The Center also hopes to adapt the CERES crop model —

specifically its subsystem of interaction between plant nutrients and soil — for rice, maize, wheat, groundnut, sorghum, millet, and taro. Other areas of opportunity for collaboration include policy research and studies of plant-nutrient efficiency in systems of low water use.